

TECHNOLOGICAL ADVISORY COUNCIL (TAC) NOISE FLOOR TECHNICAL INQUIRY

ET Docket No. 16-191

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Submitted By:

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1. Is there a noise problem? **Absolutely**
- a. If so, what are the expected major sources of noise that are of concern?
- Switched mode power supplies (Bookcase lighting power supplies, Nintendo Game after market power supplies, etc.)
  - Variable Speed Drives (HVAC Systems, Treadmills, Manufacturing Equipment).
  - Light Dimmers (120 Vac LED Light Dimmers)
  - Plasma TV's
  - Power Lines (due to arcing)
  - Invisible fence systems
  - DSL providers (due to signal egress)
  - Over the horizon radar
- b. What services are being most impacted by a rising spectrum noise floor?
- National Time Standard transmissions, AM Broadcasters, Ham Radio Operators, International Shortwave Broadcasters, DSL users (due to RFI ingress), Cordless Phones, Invisible Fence owners, Aviation, etc.
- c. If incidental radiators are a concern, what sorts of government, industry, and civil society efforts might be appropriate to ameliorate the noise they produce?
- Mandatory compliance testing, and prompt strict enforcement.
  - Radiated limits (not just conducted limits) for all frequencies.

2. Where does the problem exist? **Everywhere**

a. Spectrally

i. What frequency bands are of the most interest?

**LW, MW, HF, VHF**

b. Spatially

i. Indoors vs outdoors?

**For various incidental radiators the problem is worse indoors than outdoors, but for other incidental radiators it does not matter.**

ii. Cities vs rural settings?

**Does not matter.**

iii. How close in proximity to incidental radiators or other noise sources?

**Typically up to 0.5 miles for most devices, but power line arcing can be a problem at a much greater distance (typically 0.5 to 1 mile, but greater distances are not uncommon).**

iv. How can natural propagation effects be accounted for in a noise study?

c. Temporally

i. Night versus day?

ii. Seasonally?

3. Is there quantitative evidence of the overall increase in the total integrated noise floor across various segments of the radio frequency spectrum? **Note: Some noise sources appear as broadband white noise, while other noise sources appear as discrete repeating frequencies of unintended emission. It's probably much harder to determine the impact of the white noise RFI generators on the overall integrated noise floor unless it can be turned on and off, while it's much easier capturing the impact of the discrete frequency noise generators.**

a. At what levels does the noise floor cause harmful interference to particular radio services?

**Any increase in noise floor causes harmful interference as service area will be reduced.**

b. What RF environment data from the past 20 years is available, showing the contribution of the major sources of noise?

c. Please provide references to scholarly articles or other sources of spectrum noise measurements.

#### 4. How should a noise study be performed?

The problem is well known and documented for numerous sources of incidental radiators, so a noise study is not needed. It does not matter if the “overall” noise floor has increased, or if there are discrete frequencies of interference causing interference on specific frequencies, the end result is the same (reduced communications capability).

- a. What should be the focus of the noise study?
- b. How should it be funded?
- c. What methods should be used?
- d. How should noise be measured?
  - i. What is the optimal instrumentation that should be used?
  - ii. What measurement parameters should be used for that instrumentation?
  - iii. At what spatial and temporal scales should noise be measured?
  - iv. Should the monitoring instrumentation be capable of determining the directions of the noise sources? If so, how would those data be used?
  - v. Is there an optimal height above ground for measurements?
- e. What measurement accuracy is needed?
  - i. What are the statistical requirements for sufficient data? Would these requirements vary based on spectral, spatial and temporal factors?
  - ii. Can measurements from uncalibrated, or minimally calibrated, devices be combined?
  - iii. Is it possible to “crowd source” a noise study? Would receiver noise measurements commonly logged by certain users (e.g. radio astronomers, cellular, and broadcast auxiliary licensees) be available and useful for noise floor studies?
- g. How much data must be collected to reach a conclusion?
- h. How can noise be distinguished from signals?
- i. Can noise be characterized and its source identified?
- ii. Is there a threshold level, below which measurements should be ignored?

## **Links to my webpages that document specific cases of RFI**

### **Low Voltage Bookcase Lighting:**

<http://sites.google.com/site/bookcaselightsrfi/>

### **Nintendo after market power supply:**

<http://sites.google.com/site/3dspowersupplyrfi/>

### **HVAC Variable Speed Drive:**

<http://sites.google.com/site/broadbandrfi/>

### **Injection Molding Machine Variable Speed Drive:**

<http://sites.google.com/site/rfimetrol/>

### **Power Line Noise:**

<http://sites.google.com/site/powerlinenoisehistory/>

### **Treadmill RFI:**

<http://sites.google.com/site/treadmillrfi/>

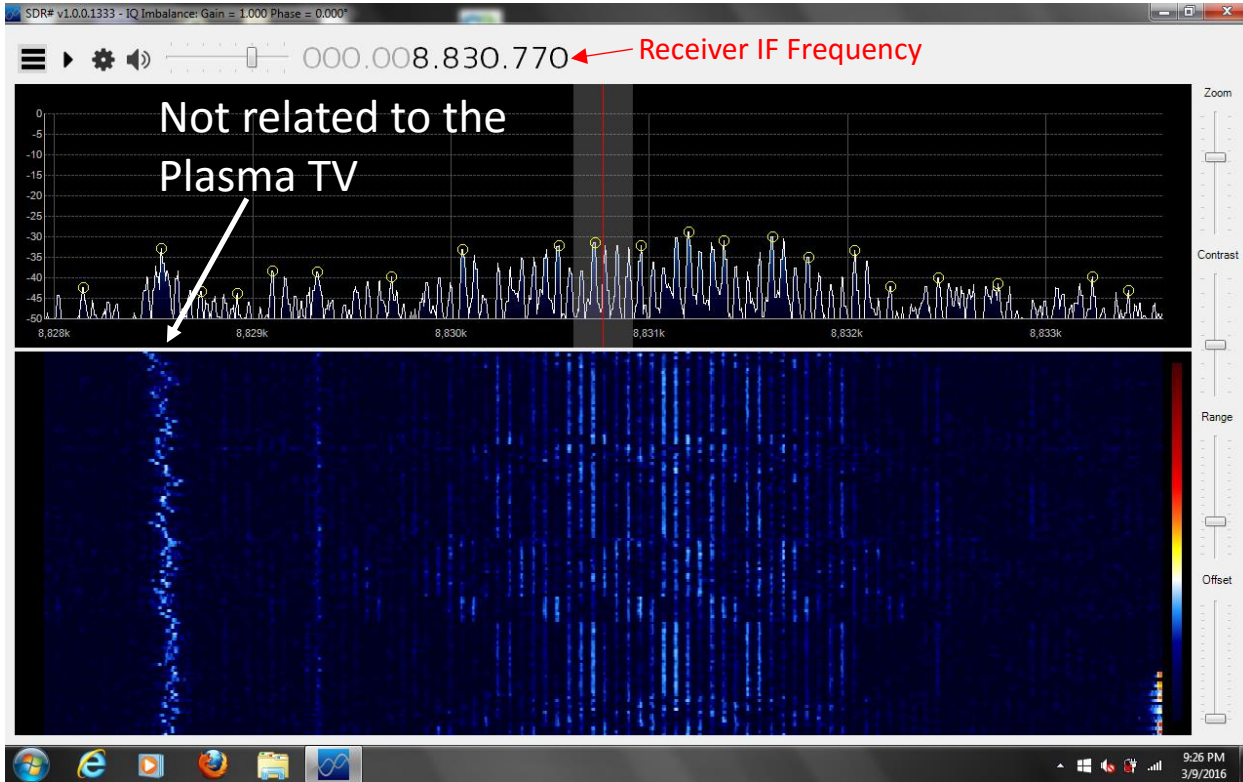
### **Yet To Be Determined RFI:**

<http://sites.google.com/site/house160metersrfi/>

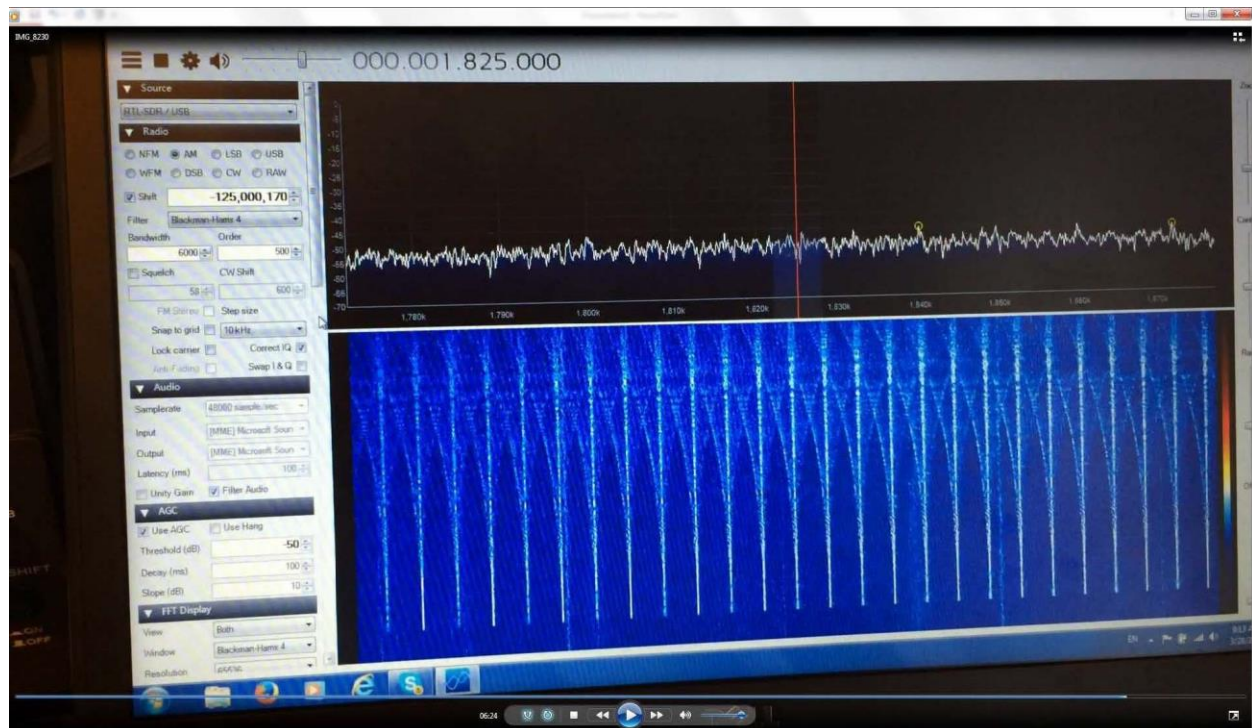
Example plots of some common incidental radiators

**Plasma TV Spectrum Plot, TV located 950 feet away and is below grade in a basement**

**1.8264 MHz Plasma TV RFI, SDR AGC ON, SDR NB Off**



## HVAC Variable Speed Drive Start Up, Distance = 0.4 miles





### Suspect AT&T Uverse Interference Plot (yet to be confirmed)

